

**Before the Federal Communications Commission  
Washington, D.C. 20554**

In the matter of	)	
	)	
Interference Immunity Performance Specifications	)	ET Docket No. 03-65
for Radio Receivers	)	

**Comments of Nortel Networks**

Nortel Networks (Nortel) is pleased to have the opportunity to comment in this proceeding. We commend the Commission for taking this important step of examining the potential utility of interference immunity performance specifications for radio receivers. Nortel Networks is a leading provider of wireless network infrastructure based on a comprehensive portfolio of solutions supporting key wireless technologies and enabling clear evolution paths to next generation networks. Nortel Networks wireless technology has been deployed in more than 65 countries around the world. Nortel Networks therefore has significant interest in the outcome of this inquiry.

Our comments below will proceed by paragraph numbers consistent with the Commission's notice.

**Paragraph 4:** Nortel agrees with the statement in paragraph 4 that radio interference can occur when RF energy other than a desired signal is present in a receiver. However it is also important to realize that good system design will attempt to define and mitigate against known sources of interference, but is unable to do so for future unknown changed sources of interference. At the end of the paragraph, the notice states "The adverse effects of undesired energy present in a receiver can be minimized by improved design of the receiver." Nortel believes that this statement obscures the important distinction between out-of-band interference and in-band interference:

- Out-of-band interference can be largely eliminated by good receiver design, if there is sufficient frequency separation between the emission from an interfering transmitter and the passband of the victim receiver
- In-band interference may be partially reduced by fundamental differences in modulation between interfering emission and desired signal, and thus may be "reduced" by good receiver design, but cannot be arbitrarily "minimized" by receiver design

**Paragraph 6:** Nortel agrees with the trend to support efficient use of the spectrum.

**Paragraph 7:** Nortel agrees with the reasonableness of the "operating restrictions" described in paragraph 7.

**Paragraph 8:** Paragraph 8 states in part that "new digital technologies generally are inherently more robust and resistant to interference." While this is true, it should equally be noted that this technology improvement has been used to increase the performance and / or traffic capacity of the system and thus the efficiency by which the spectrum is used. The resultant high capacity system may be no more tolerant of unexpected interference than the old system, without impacting significantly the performance or capacity and efficiency gains that have been achieved. Nortel would caution the Commission against any change in spectrum policy, which would permit increased interference, on the basis of "digital improvements" because this will directly impact these performance, capacity, cost, and efficiency gains.

**Paragraph 9-10:** As noted above, modern digital receivers already use their improved capabilities to provide enhanced service performance and / or enhanced capacity. Caution, therefore, should be exercised in eliminating conventional regulatory processes that limit in-band interference in heavily used bands as implied in paragraphs 9 and 10.

**Paragraph 12:** Nortel agrees that frequency selectivity is a key metric in receiver performance. For many receivers (and especially high quality multi-channel frequency agile receivers used for mobile services), the selectivity will be determined by two (or more) stages of filtering:

- the first stage of filtering is aligned with the intended operating band of the receiver
- a second stage of filtering is aligned with the specific channel of operation

It should be noted that a high-powered interfering signal adjacent to the first stage may overload the receiver and compromise the second stage (and any automatic gain control mechanism (AGC)) and thus directly impact the overall receiver performance. Thus some frequency separation (and regulatory band planning) will be essential from high power interference. This is especially true for modern receivers, which operate with signals which are near or even below the inherent thermal noise power density. A consequence of RF receiver design is that dynamically adding new services interstitially with arbitrary existing services may cause significant receiver problems both to the existing services and the added service. This may adversely impact the performance complexity and complexity of both systems. These aspects will be especially important if the service on either system is mobile or nomadic.

Dynamic range and AGC can jointly compensate for variations in radio pathloss due to distance between desired transmitter and intended receiver, but are much less useful to provide compensation for interference except in the rare cases where the desired transmitter and intended receiver have a low pathloss due to close proximity. Thus while these parameters affect receiver performance, they are not good parameters for control of interference as suggested in paragraph 12.

**Paragraph 13:** The Commission suggests that signal processing can enhance interference immunity,. However, in modern mobile communications, signal processing already provides substantial isolation from interference from other users in the same system. While undesired interference will be reduced by signal processing, any extraneous undesired interference will still significantly degrade either the performance or the capacity of the mobile system and potentially increasing per user costs.

**Paragraph 14:** Here the Commission requests comment on factors which impact receiver interference immunity. Modern receivers already include many engineering decisions to maximize performance & capacity in an environment of known interference. Such decisions cannot then be simply re-applied to provide additional interference immunity without compromising desired performance. Thus the net impact of any factors also need to account for the existing interference environment within the system design.

**Paragraph 15:** The characteristics of the RF environment in paragraph 15 should include the fundamental background noise within the band of interest (principally thermal noise, however also some generic man-made noise), the intended system self-interference and propagation artifacts of the environment e.g., antenna height, building attenuation, foliage and rain attenuation etc. As noted in our response to paragraph 12, the existence of high power transmitters in adjacent bands may be a crucial limit of the interference environment for the receiver design.

**Paragraph 16:** ITU-R Study Group 1 and Study Group 3 have spent many years identifying models for environments in many radio bands. It seems unlikely therefore that a single environment model as suggested in paragraph 16 would be viable.

**Paragraph 17:** Modern transceivers already use software control of many aspects of their operation to provide today's cost-effective radio communications (both land-mobile and fixed technologies). Such techniques could be effectively applied to some long-standing services to improve system performance. However existing modern systems may have little room for further improvement.

**Paragraphs 18-21:** Nortel agrees with the Commission's preference in paragraphs 18 - 21 for voluntary industry standards.

- Nortel believes that regulations on receiver performance should be limited to limits on susceptibility to out-of-band emission. No limits should be placed on in-band performance, so that competitive

pressures in the market-place drive future system enhancements and innovation. Equally the Commission should continue to control out-of-band transmitter emissions.

- Nortel believes that the Commission should continue their working relationships with the existing ANSI accredited standards bodies (e.g. IEEE, TIA, ATIS, Committee T1), international standards bodies (e.g. ITU-R) and related organizations (e.g. 3GPP and 3GPP2.)

With regard to paragraph 21, Nortel agrees that the three general models from the Spectrum Task Force are a good basis for spectrum rights and believes that “command & control” is highly applicable to public safety systems and to passive science systems where performance needs will supercede the desire for spectral efficiency.

**Paragraphs 25-26:** Nortel concurs with the view in paragraphs 25 & 26, that public safety needs special consideration. We believe that proposals currently being developed within the TIA will ensure high receiver performance for future equipment. On the other hand, it may be difficult or expensive to retroactively apply tighter requirements to existing public safety equipment. Where “general communication equipment” is dedicated for public safety services, such equipment should also meet the same requirements. But this should NOT be imposed on equipment (e.g. PCS), which may occasionally be used for 911 calls, but is normally being used for non-public safety purposes.

**Paragraphs 28-29:** Nortel believes that as discussed in paragraphs 28 & 29, mobile radio services constitute a very demanding application for minimizing interference. However we believe that the activities of the existing industry standards bodies combined with market forces are sufficient to ensure high receiver performance within this competitive environment and, therefore, definition of stringent regulations is unnecessary.

**Paragraph 37:** In paragraph 37, the Commission notes that receiver performance specifications could impact innovative designs. Nortel agrees with this concern. For example, within the past few years, significant effort within TIA TR45 has resulted in substantial changes within the various IS-95 / 1xRTT specifications. Some of these innovations have necessitated improved receiver specifications and resulted in improved spectral efficiency and higher system capacity. These changes may have been negatively impacted or even blocked, if the original specification was established by regulation. Nortel is concerned that a possible consequence of defining minimum performance sensitivities may imply an “acceptable” interference-generated noise floor. Such an interference noise floor would nullify future attempts to improve performance and stifle any attempt to innovate by reducing emissions or improving receiver sensitivity beyond this level.

Nortel believes that “treatment of existing receivers” can be handled by market forces in most cases as equipment reaches its natural end of life. The exception may be if the Commission authorizes new transmitters into an existing band. In this case, crucial services, such as public safety, where performance is paramount and guarantee of service is vital, may require special conversion considerations or interference protection.

Nortel Networks looks forward to continuing to work with the Commission as it proceeds to examine these issues more fully.

Respectfully submitted,

Raymond L. Strassburger  
Vice President and Washington Counsel

Nortel Networks

801 Pennsylvania Ave. N.W. Suite 700  
Washington, D.C. 20004  
(202) 347 4610

July 21, 2003